PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Jiansheng FU, et al.
US National Stage Serial No.:
10/598,362
Confirmation No.: 3176
Int'l Appl. No.: PCT/CN2005/000520
Int'l Filing Date: 18 APRIL 2005
For: PIGMENT HAVING ANGLE DEPENDENCE OF THE INTERFERENCE COLORS AND ITS PRODUCTION PROCESS

Atty Docket No.: WHKY-00101-NUS
Art Unit: 1731
Examiner: PARVINI, PEGAH
Paper Type: Appeal Brief
Date transmitted: 5/19/2011

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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APPEAL BRIEF

SIR:

As required under 37 C.F.R. § 41.37(a)(1), this brief is filed within 2 months from date of filing of the notice of appeal under 37 C.F.R. § 41.31, or within an appropriate time extension period thereto obtained under 37 C.F.R. § 1.136(a). **As required under 37 C.F.R. § 41.37 (a)(2), the fees specified in 37 C.F.R. § 41.20 (b)(2) are submitted herewith via EFS-Web.**

This Brief contains items under the following headings as required by 37 C.F.R. § 41.37 (c)(1) and M.P.E.P. § 1205.02:

I. Real Party in Interest
II. Related Appeals and Interferences
III. Status of Claims
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V. Summary of Claimed Subject Matter
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I. REAL PARTY IN INTEREST

The real parties in interest for this appeal are the Applicants: Jiansheng FU, Yiting PENG and Xiaohui TIAN.

II. RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings known to the Appellants which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 20 claims pending in this application.

B. Current Status of Claims

1. Claims canceled: 1-10 and 12
2. Claims withdrawn from consideration but not canceled: 18-23
3. Claims pending: 11 and 13-31
4. Claims allowed: none
5. Claims allowable (objected to): none
6. Claims rejected: 11, 13-17 and 24-31

C. Claims on Appeal

The claims on appeal are 11, 13-17 and 24-31.

IV. STATUS OF AMENDMENTS

Appellants did not file an Amendment after Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent claim 11

The invention is directed in independent claim 11 to **a pigment exhibiting a color-shifting effect comprising: a base material** (the base material is disclosed in paragraphs [0017], [0028], [0032], [0044], [0051], [0053] and [0082] of the specification, i.e., English language translation of the PCT application No. PCT/CN2005/000520, filed on 8/26/2006)**; a first layer having a first optical thickness** (this limitation is disclosed in paragraphs [0019], [0029] and [0082] of the specification)**; a second layer having a second optical thickness** (this limitation is disclosed in paragraphs [0018], [0020], [0030], [0040] and [0082] of the specification)**; a third layer** (the third layer is disclosed in paragraphs [0017] and [0082] of the specification)**; and optionally an outer protective layer** (the protective layer is disclosed in paragraphs [0017], [0026] and [0045] of the specification)**, wherein said base material is a mica** (mica used as the base material is disclosed in paragraphs [0017]-[0020], [0023], [0028], [0031], [0032], [0034], [0036], [0039], [0044], [0051]-[0053], [0055]-[0066], [0068]-[0070], [0074], [0075] and [0082] of the specification)**; said first layer and said third layer each independently comprise a metal oxide having a high refractive index** (the first layer comprising a metal oxide having a high refractive index is disclosed in paragraphs [0017], [0019], [0029] and [0082] of the specification, and the third layer comprising a metal oxide having a high refractive index is disclosed in paragraphs [0017] and [0082] of the specification)**; said second layer comprises a metal oxide having a low refractive index** (this limitation is disclosed in paragraphs [0017], [0018] [0020], [0021], [0030], [0040] and [0082] of the specification)**; said base material is coated with (1) said first layer, (2) said second layer, (3) said third layer, and optionally (4) said outer protective layer** (this limitation is disclosed in paragraph [0017] of the specification)**, said first layer being in direct contact with said base material** (this limitation is disclosed in paragraphs [0036], [0055]-[0066], and [0069]-[0070] of the specification)**, said second layer being in**

direct contact with said first layer and said third layer (this limitation is disclosed in paragraphs [0036], [0055]-[0066], and [0069]-[0070] of the specification)**, and said protective layer being in direct contact with said third layer** (this limitation is disclosed in paragraph [0026] of the specification)**; said first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color** (these limitations are disclosed in paragraphs [0019], [0029], [0039], and [0082] of the specification)**; and the pigment exhibits a color-shifting effect** (the fact that the pigment exhibits a color-shifting effect is disclosed in paragraphs [0002], [0017], [0029], [0030], [0034], [0044], and [0081] of the specification)**.**

Independent claim 24

The invention is directed in independent claim 20 to **a pigment exhibiting a color-shifting effect comprising: a base material** (the base material is disclosed in paragraphs [0017], [0028], [0032], [0044], [0051], [0053], and [0082] of the specification)**; a first layer having a first optical thickness that is well-defined** (this limitation is disclosed in paragraphs [0019], [0029], [0039], and [0082] of the specification)**; a second layer having a second optical thickness that is well-defined** (this limitation is disclosed in paragraphs [0018], [0020], [0030], [0040], and [0082] of the specification)**; a third layer** (the third layer is disclosed in paragraphs [0017], and [0082] of the specification)**; and optionally an outer protective layer** (the protective layer is disclosed in paragraphs [0017], [0026], and [0045] of the specification)**, wherein said base material is a mica** (mica used as the base material is disclosed in paragraphs [0017]-[0020], [0023], [0028], [0031], [0032], [0034], [0036], [0039], [0044], [0051]-[0053], [0055]-[0066], [0068]-[0070], [0074], [0075], and [0082] of the specification)**; said first layer and said third layer each independently comprise a metal oxide having a high refractive index** (the first layer comprising a metal oxide having a high refractive index is disclosed in paragraphs [0017], [0019], [0029], and [0082] of the specification, and the third layer comprising a metal oxide having a high refractive index is disclosed in paragraphs [0017] and [0082] of the specification)**; said second layer comprises a metal oxide having a low refractive index** (this limitation is disclosed in paragraphs [0017], [0018] [0020], [0021], [0030], [0040], and [0082] of the specification)**; said base material is coated with (1) said first layer, (2) said second layer, (3)**

said third layer, and optionally (4) said outer protective layer (this limitation is disclosed in paragraph [0017] of the specification)**, said first layer being in direct contact with said base material** (this limitation is disclosed in paragraphs [0036], [0055]-[0066], and [0069]-[0070] of the specification)**, said second layer being in direct contact with said first layer and said third layer** (this limitation is disclosed in paragraphs [0036], [0055]-[0066], and [0069]-[0070] of the specification)**, and said protective layer being in direct contact with said third layer** (this limitation is disclosed in paragraph [0026] of the specification)**; said first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color** (these limitations are disclosed in paragraphs [0019], [0029], [0039], and [0082] of the specification)**; said second optical thickness is greater than an optical thickness of a second order interference color** (this limitation is disclosed in paragraphs [0018], [0030], [0040], and [0082] of the specification)**; and the pigment exhibits a color-shifting effect** (the fact that the pigment exhibits a color-shifting effect is disclosed in paragraphs [0002], [0017], [0029], [0030], [0034], [0044], and [0081] of the specification)**.**

Independent claim 28

The invention is directed in independent claim 28 to **a pigment exhibiting a color-shifting effect comprising a base material** (the base material is disclosed in paragraphs [0017], [0028], [0032], [0044], [0051], [0053], and [0082] of the specification)**; a first layer having a first optical thickness that is well-defined** (this limitation is disclosed in paragraphs [0019], [0029], [0039], and [0082] of the specification)**; a second layer having a second optical thickness that is well-defined** (this limitation is disclosed in paragraphs [0018], [0020], [0030], [0040], and [0082] of the specification)**; a third layer** (the third layer is disclosed in paragraphs [0017] and [0082] of the specification)**; and optionally an outer protective layer** (the protective layer is disclosed in paragraphs [0017], [0026], and [0045] of the specification)**, wherein said base material is a mica** (mica used as the base material is disclosed in paragraphs [0017]-[0020], [0023], [0028], [0031], [0032], [0034], [0036], [0039], [0044], [0051]-[0053], [0055]-[0066], [0068]-[0070], [0074], [0075], and [0082] of the specification)**; said first layer and said third layer each independently comprise a metal oxide having a high refractive index** (the first

layer comprising a metal oxide having a high refractive index is disclosed in paragraphs [0017], [0019], [0029], and [0082] of the specification, and the third layer comprising a metal oxide having a high refractive index is disclosed in paragraphs [0017] and [0082] of the specification)**; said second layer comprises a metal oxide having a low refractive index** (this limitation is disclosed in paragraphs [0017], [0018] [0020], [0021], [0030], [0040], and [0082] of the specification)**; said base material is coated with (1) said first layer, (2) said second layer, (3) said third layer, and optionally (4) said outer protective layer** (this limitation is disclosed in paragraph [0017] of the specification)**, said first layer being in direct contact with said base material** (this limitation is disclosed in paragraphs [0036], [0055]-[0066], and [0069]-[0070] of the specification)**, said second layer being in direct contact with said first layer and said third layer** (this limitation is disclosed in paragraphs [0036], [0055]-[0066], and [0069]-[0070] of the specification)**, and said protective layer being in direct contact with said third layer** (this limitation is disclosed in paragraphs [0026] of the specification)**; said first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color** (these limitations are disclosed in paragraphs [0019], [0029], [0039], and [0082] of the specification)**; said second optical thickness is greater than an optical thickness of a second order green interference color and smaller than an optical thickness of a fourth order interference color** (this limitation is disclosed in paragraphs [0020], [0030], and [0040] of the specification)**; and the pigment exhibits a color-shifting effect** (the fact that the pigment exhibits a color-shifting effect is disclosed in paragraphs [0002], [0017], [0029], [0030], [0034], [0044], and [0081] of the specification)**.**

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Whether claims 24-31 are indefinite under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

2. Whether claims 11, 13-16, 24-26, and 28-30 are unpatentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,579,355 to Schmidt et al. ("Schmidt") in view of U.S. Pat. No. 6,485,556 to DeLuca, Jr. ("DeLuca, Jr.") and in view of U.S. Pat. No. 6,238,471 to Vogt et al. ("Vogt").

3. Whether claims 17, 27 and 31 are unpatentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,579,355 to Schmidt et al. ("Schmidt") in view of U.S. Pat. No. 6,485,556 to DeLuca, Jr. ("DeLuca, Jr.") and U.S. Pat. No. 6,238,471 to Vogt et al. ("Vogt"), and in view of U.S. Patent No. 4,482,389 to Franz et al. ("Franz").

VII. ARGUMENT

1. Whether claims 24-31 are indefinite under 35 U.S.C. 112, second paragraph, for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

A. Appellants have not stated that the invention is something different from what is defined by the claims.

The first requirement set forth in the second paragraph of 35 U.S.C. 112 is that the claims must set forth the subject matter that Applicant regards as his invention. The focus of the inquiry is on whether somewhere other than in the Application as filed, the Appellants have stated that the invention is something different from what is defined in the claims. Appellants have not made any such statements and the Examiner has not referred to any such statements by the Appellants in making his rejection. Specifically, Appellants claim the limitations of "a first layer having a first optical thickness that is well-defined" and "a second layer having a second optical thickness that is well-defined" in claims 24 and 28, and by virtue of dependency in the dependent claims

25-27 and 29-31, and these are precisely the limitations that Appellants intend to claim. Accordingly, the invention set forth in the instant claims must be presumed to be that which Appellants regards as their invention.

B. The limitations in the claims meet the threshold requirement of clarity and precision.

The second requirement set forth in the second paragraph of 35 U.S.C. 112 is that the claims must particularly point out and distinctly define the metes and bounds of the subject matter that will be protected by the patent grant. The focus of the inquiry is on whether the claims meet the threshold requirements of clarity and precision, i.e., whether they define the patentable subject matter with a reasonable degree of particularity and distinctness.

Appellants' claimed limitations of "a first layer having a first optical thickness that is well-defined" and "a second layer having a second optical thickness that is well-defined" apprise one of ordinary skill in the art of the claim scope and provide a clear warning to others as to what constitutes infringement of the patent; thus, the claims define the patentable subject matter with a reasonable degree of particularity and distinctness, and particularly point out and distinctly define the metes and bounds of the subject matter that will be protected by the patent grant.

The Examiner appears to argue that because Appellants have not specified what range is referred to by reciting "well-defined" optical thickness in the recitations of instant claims 24 and 28, it is unclear what Appellants are trying to claim (see, Final Office Action dated on 7/20/2010, page 3, lines 4 and 5, "It is not clear as to what range applicants are referring to by reciting 'well-defined' optical thickness in the recitations of instant claims 24 and 28.").

Appellants respectfully submit that "well-defined" generally means not ambiguous, i.e., not conflicting in terms of how it has been defined. Optical thickness for a particular layer is well-defined because it is tied to the optical thickness of an interference color, which, in turn, is defined as the optical thickness under which a specific interference color is exhibited when interference phenomenon occurs. (The optical thickness of a thin film is the product obtained by

multiplying the physical thickness of the film by the refractive index of the film medium. In film interference theory, the interference color is determined by the optical path difference between the two beans of coherent light, and the optical path difference is a function of the optical thickness. Therefore, a film with a specific optical thickness exhibits a corresponding interference color when interference phenomenon occurs.)

As such, a skilled artisan would understand that "a first layer having a first optical thickness that is well-defined" means a first layer with an unambiguously specified first optical thickness, and "a second layer having a second optical thickness that is well-defined" means a second layer with an unambiguously specified second optical thickness.

Accordingly, at least for the reasons set forth in A and B above, Appellants respectfully submit that the pending claims are not indefinite.

2. Whether claims 11, 13-16, 24-26, and 28-30 are unpatentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,579,355 to Schmidt et al. ("Schmidt") in view of U.S. Pat. No. 6,485,556 to DeLuca, Jr. ("DeLuca, Jr.") and in view of U.S. Pat. No. 6,238,471 to Vogt et al. ("Vogt").

The factual determinations underpinning the legal conclusion of obviousness include:1) the scope and content of the prior art, 2) the level of ordinary skill in art, 3) the differences between the claimed invention and the prior art, and 4) evidence of secondary factors, also known as objective indicia of non-obviousness. See, Eisai Co., Ltd. v. Dr. Reddy's Laboratories, Ltd., 533 F.3d 1353 (Fed. Cir. 2008) citing Graham v. John Deere Co., 383 U.S. 1, 17-18 (1966).

2.1 Independent claims 11, 24, and 28, and dependent claims 13-16, 25-26, and 29-30

The Scope and Content of the Prior Art

Schmidt recites an interference pigment comprising a multiply-coated platelet-shaped substrates, having at least one layer sequence of (A) a high refractive index coating comprising a mixture of TiO_2 and Fe_2O_3 in a weight ratio of about 10:1 to about 1:3 and optionally, one or more metal oxides in amounts of ≤ about 20% by weight based on the layer (A), (B) a colorless coating having a low refractive index n ≤ about 1.8, and optionally (C), an outer protective layer.

DeLuca, Jr. recites a titanium dioxide nacreous pigment comprising platelets of titanium dioxide of about 1-75 μm in length and an interference thickness of about 5-600 nm and having a chromium coating thereon and an iron oxide coating on the chromium coating. DeLuca, Jr. also recites that the refractive index of TiO_2 is 2.6-2.9.

Vogt recites a multilayer interference pigment having a blue mass tone, comprising a platelet-shaped carrier material and a coating which is formed from (i) a first layer of cobalt aluminate, cobalt-containing glass, tungsten bronzes of cobalt oxide, (ii) a second layer of colorless, transparent metal oxide of a first refractive index and (iii) a third, outer layer of a colorless, transparent metal oxide of a second refractive index higher than the first refractive index. Vogt also recites that the colorless, transparent metal oxide of low refractive index is SiO_2 and the refractive index of the second layer is in the range of 1.35-1.80.

The Level of Ordinary Skill in the Art

A person of ordinary skill in the art with respect to the pending claims is a pigment formulation chemist. Ordinary skill in the chemical arts is generally low. In general, and apart from special circumstances pigment formation chemists would not know how to select the substances for each layer in a mica-based pigment and how to determine the thickness for each layer to produce a pigment having a color-shifting effect. This is to say also that the chemical arts are often unpredictable. See, e.g., Eisai at 1359 (Fed. Cir. 2008) ("To the extent an art is unpredictable, as the chemical arts often are […]").

The Differences between the Claimed Invention and the Related Art

A. Schmidt does not teach or recite the limitation "the pigment exhibits a color-shifting effect" and, in fact, Schmidt teaches away from this limitation

Appellants' independent claims 11, 24, and 28, and dependent claims 13-16, 25-26, and 29-30 teach a pigment that exhibits color-shifting effect, the pigment comprising a first layer having a first optical thickness, wherein the first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color. Color shifting effect means that the color of the pigment varies when observed between vertical and horizontal angles of viewing. (See paragraph [0081] of the specification as originally filed, which describe that the color-shifts between purplish-red and yellow-green). This results in a pigment having a luster ranging from silk-like to glittering. As a result of the color-shifting effect, Appellants' pigments find widespread commercial applications, e.g., in car coatings, paints, decorative paper, etc., and as such they beautify our life. Appellants are first to teach the claimed color-shifting pigment comprising a mica base material alternately coated with high and low refractive metal oxide, and are first to solve the critical technical problem of how an optical thickness of the pigment layers relates to the color-shifting effect.

On the contrary, Schmidt discloses an interference pigment comprising multiply-coated platelet-shaped substrates, which exhibits *only* two main interference colors, gold and a reddish orange. Schmidt's pigment does not exhibit a color-shifting effect. Hereto, Schmidt specifically states that over the broad range of thicknesses disclosed, no angle dependence of the interference color, i.e., no color shifting, could have been obtained. See, Schmidt, col. 2, lines 18-20, stating that "unlike goniochromatic pigments, the pigments of the invention provide a color effect which has little if any angle dependence." In other words, Schmidt teaches away from Appellants' invention. Because Schmidt teaches away from Appellants' invention, a person of ordinary skill in the art would not have been motivated to choose a specific layer recited by Schmidt and to choose a particular optical thickness for the layer that falls into the thickness range recited by Schmidt. This is particularly so in light of the low level of skill in the chemical arts. Contrary to the teaching of Schmidt, Appellants have achieved a color-shifting pigment precisely by setting

the first optical thickness of a first layer comprising a metal oxide having a high refractive index to fall within the broad range of Schmidt.

B. Appellants achieve a new result, i.e., a pigment exhibiting a color shifting effect, as a result of the particular range of the first optical thicknesses selected; and the range of Appellants' first optical thickness is critical to achieving the new result.

Appellants' independent claims 11, 24, and 28, and dependent claims 13-16, 25-26, and 29-30 teach a pigment that exhibits color-shifting effect. Color shifting effect means that the color of the pigment varies when observed between vertical and horizontal angles of viewing. (See paragraph [0081] of the specification as originally filed, which describes that the color-shifts between purplish-red and yellow-green). This results in a pigment having a luster ranging from silk-like to glittering. As a result of the color-shifting effect, Appellants' pigments find widespread commercial applications, e.g., in car coatings, paints, decorative paper, etc., and as such they beautify our life. Appellants are first to teach the claimed color-shifting pigment comprising a mica base material alternately coated with high and low refractive metal oxide, and are first to solve the critical technical problem of how an optical thickness of the pigment layers relates to the color-shifting effect.

The color shifting effect in Appellants' pigments is exhibited because of the precisely controlled optical thickness of the layers, i.e., the first optical thickness which is greater than an optical thickness of silver-white interference color but smaller than an optical thickness of golden-yellow interference color. In Appellants' invention as claimed, the optical thickness of the first layer is in the range of between about 300 nm and about 800 nm.

In Schmidt, the *physical* thickness of any of the metal oxide layers is generally within the range from about 10 to about 1000 nm. See, Schmidt, col. 3, lines 23-28. If TiO_2 is taken as the first layer, the *optical* thickness of the first layer in Schmidt would be in the range of between about 26 nm and about 2900 nm. The optical thickness is calculated by multiplying the physical thickness disclosed in Schmidt by the refractive index of TiO_2 (2.6-2.9) recited in DeLuca, Jr.

(DeLuca, Jr. is cited by the Examiner only as evidence of the refractive index of TiO_2 and not as a reference over which the rejection is made).

Accordingly, there is an overlap between the optical thickness range disclosed by Schmidt and the first optical thickness claimed by Appellants. The optical thickness range disclosed by Schmidt is quite broad, and Appellants' first optical thickness (between about 300 nm to about 800 nm) falls within that broad range.

Even though there is an overlap between the optical thickness range disclosed by Schmidt and the first optical thickness claimed by Applicant, the range claimed by Appellants is critical to obtaining a color-shifting pigment. The color-shifting pigments claimed in the present invention would not be obtained if the optical thickness of the first layer would not fall within the claimed range. The optical thickness range in Schmidt is very board and amounts to about 2900 nm. Appellants' optical thickness range amounts to about 500 nm. Schmidt does not expect that a pigment having angle dependence of the interference colors can be obtained by selecting much narrower optical thickness range as claimed in the present invention. An ordinary skilled person in the art would not know whether narrowing the broad range disclosed by Schmidt would result in a thickness range needed to obtain a pigment having a color-shifting effect. In addition, because there are multiple layers and a plethora of choices exist for the optical thickness of each layer, selecting the optical thicknesses of each layer to obtain a pigment with a color-shifting effect does not amount to routine experimentation. Because the range of the first optical thickness is critical to the result obtained (i.e., color-shifting), the difference between the claimed invention and Schmidt is significant, it is not within the daily routine of a skilled person, and Appellants invention does require inventive skill. See, e.g., In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). This rebuts the presumption of obviousness.

2.2 Independent claims 24, and dependent claims 25 and 26

In addition to the arguments advanced in section 2.1 (vide infra), Appellants respectfully submit that the color shifting effect with respect to the subject matter of independent claim 24 and

dependent claims 25 and 26 is exhibited because of the precisely controlled optical thickness of the layers, i.e., the first optical thickness which is greater than an optical thickness of silver-white interference color but smaller than an optical thickness of golden-yellow interference color, and the second optical thickness which is greater than an optical thickness of a 2nd-order interference color. In Appellants' invention as claimed, the optical thickness of the first layer is in the range of between about 300 nm and about 800 nm, and the optical thickness of the second layer is greater than about 1100 nm.

In Schmidt, the *physical* thickness of any of the metal oxide layers is generally within the range from about 10 to about 1000 nm (see, Schmidt, col. 3, lines 23-28). If TiO_2 for the first layer and SiO_2 for the second layer are taken as an example, the *optical* thickness is in the range of between about 26 nm and about 2900 nm for the first layer and between about 13.5 nm and about 1800 nm for the second layer.

An ordinary skilled person in the art would not know whether narrowing the broad range disclosed by Schmidt with respect to both the first layer and the second layer would result in a thickness range needed to obtain a pigment having a color-shifting effect. In addition, because there are multiple layers and a plethora of choices exists for the optical thickness of each layer, selecting the optical thicknesses of each layer to obtain a pigment with a color-shifting effect does not amount to routine experimentation. Because the range of the first optical thickness is critical to the result obtained (i.e., color-shifting), the difference between the claimed invention and Schmidt is significant, it is not within the daily routine of a skilled person, and Appellants invention does require inventive skill. See, e.g., In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). This rebuts the presumption of obviousness.

2.3 Independent claims 28, and dependent claims 29-30

In addition to the arguments advanced in section 2.1 (vide infra), Appellants respectfully submit that the color shifting effect with respect to the subject matter of independent claim 28 and dependent claims 29 and 30 is exhibited because of the precisely controlled optical thickness of

the layers, i.e., the first optical thickness which is greater than an optical thickness of silver-white interference color but smaller than an optical thickness of golden-yellow interference color, and the second optical thickness which is greater than an optical thickness of a second order green interference color and smaller than an optical thickness of a fourth order interference color.

In Appellants' invention as claimed, the optical thickness of the first layer is in the range of between about 300 nm and about 800 nm, and the optical thickness of the second layer is in the range of between about 1100 nm and about 1650 nm.

In Schmidt, the *physical* thickness of any of the metal oxide layers is generally within the range from about 10 to about 1000 nm (see, Schmidt, col. 3, lines 23-28). If TiO_2 for the first layer and SiO_2 for the second layer are taken as an example, the *optical* thickness is in the range of between about 26 nm and about 2900 nm for the first layer and between about 13.5 nm and about 1800 nm for the second layer.

An ordinary skilled person in the art would not know whether narrowing the broad range disclosed by Schmidt with respect to both the first layer and the second layer would result in a thickness range needed to obtain a pigment having a color-shifting effect. In addition, because there are multiple layers and a plethora of choices exists for the optical thickness of each layer, selecting the optical thicknesses of each layer to obtain a pigment with a color-shifting effect does not amount to routine experimentation. Because the range of the first optical thickness is critical to the result obtained (i.e., color-shifting), the difference between the claimed invention and Schmidt is significant, it is not within the daily routine of a skilled person, and Appellants invention does require inventive skill. See, e.g., In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). This rebuts the presumption of obviousness.

For the reasons stated above, Appellants respectively submits that claims 11, 13-16, 24-26, and 28-30 are non-obvious and the Examiner's rejections of claims 11, 13-16, 24-26, and 28-30 cannot stand.

3. Whether claims 17, 27 and 31 are unpatentable under 35 U.S.C. 103(a) over U.S. Pat. No. 6,579,355 to Schmidt et al. ("Schmidt") in view of U.S. Pat. No. 6,485,556 to DeLuca, Jr. ("DeLuca, Jr.") and U.S. Pat. No. 6,238,471 to Vogt et al. ("Vogt"), and in view of U.S. Patent No. 4,482,389 to Franz et al. ("Franz").

The Scope and Content of the Prior Art

In addition to the related art discussed in section 2.1 (vide supra), Franz discloses a protective layer comprising a chromium salt and one or both of a manganese salt and an iron salt. This protective layer is applied to a pigment comprising a mica flake substrate coated with a first layer of metal oxide, and thus improves the stability of the pigment to weathering (see, Franz, col. 1, lines 56-66).

The Differences between the Claimed Invention and the Related Art

Appellants' dependent claims 17, 27 and 31 teach that the outer protective layer of the pigment is an organic or an inorganic ferrous pigment. (See paragraph [0045] in the specification as originally filed). On the contrary, while Schmidt is silent as to the specific substance for the protective layer, Franz discloses a protective layer that comprises a chromium salt and one or both of manganese salt and an iron salt.

Appellants respectfully submit that a skilled artisan, given the relatively low level of skill in the art, would not have realized that the mixture of a chromium salt and one or both of a manganese salt and an iron salt could be substituted by an organic or an inorganic ferrous pigment as a protective layer without influencing the color shifting effect produced by the main layers (first, second, and third). Because ferrous pigment are generally highly colored, more so than the combination of salts used by Franz, a person of ordinary skill in the art would not be motivated to use them as a protecting layer, particularly in light of the fact that the color shifting in the present invention occurs over a broad range of colors.

Therefore, Appellants respectively submits that claims 17, 27, and 31 are non-obvious and the Examiner's rejections of claims 17, 27 and 31 cannot stand.

CONCLUSION

For at least the reasons set forth above, the rejections by the Examiner should be reversed.

DEPOSIT ACCOUNT AUTHORIZATION

Should an extension of time be required, Applicants hereby petition for same and request that the extension fee and any other fee required for timely consideration of this submission and of the Information Disclosure Statement submitted concurrently herewith be charged to **Deposit Account No. 503182**.

Customer Number: **33,794**

Respectfully Submitted,

/Matthias Scholl/

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Date: May 19, 2011

VIII. CLAIMS APPENDIX

11. A pigment exhibiting a color-shifting effect comprising

a base material;

a first layer having a first optical thickness;

a second layer having a second optical thickness;

a third layer; and

optionally an outer protective layer,

wherein

said base material is a mica;

said first layer and said third layer each independently comprise a metal oxide having a high refractive index;

said second layer comprises a metal oxide having a low refractive index;

said base material is coated with (1) said first layer, (2) said second layer, (3) said third layer, and optionally (4) said outer protective layer, said first layer being in direct contact with said base material, said second layer being in direct contact with said first layer and said third layer, and said protective layer being in direct contact with said third layer;

said first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color; and

the pigment exhibits a color-shifting effect.

13. The pigment of claim 11, wherein said second optical thickness is greater than an optical thickness of a 2nd-order interference color.

14. The pigment of claim 11, wherein said second optical thickness is greater than an optical thickness of a 2nd-order green interference color and smaller than an optical thickness of a 4th-order interference color.

15. The pigment of claim 11, wherein said metal oxide having a low refractive index is SiO_2.

16. The pigment of claim 11, wherein said metal oxide having a high refractive index is selected from TiO_2, SnO_2, Fe_2O_3, Fe_3O_4, CoO, Co_2O_3, ZrO_2, Cr_2O_3, and mixtures and derivatives thereof.

17. The pigment of claim 11, wherein said outer protective layer is an organic or an inorganic ferrous pigment.

24. A pigment exhibiting a color-shifting effect comprising

a base material;

a first layer having a first optical thickness that is well-defined;

a second layer having a second optical thickness that is well-defined;

a third layer; and

optionally an outer protective layer,

wherein

said base material is a mica;

said first layer and said third layer each independently comprise a metal oxide having a high refractive index;

said second layer comprises a metal oxide having a low refractive index;

said base material is coated with (1) said first layer, (2) said second layer, (3) said third layer, and optionally (4) said outer protective layer, said first layer being in direct contact with said base material, said second layer being in direct contact with said first layer and said third layer, and said protective layer being in direct contact with said third layer;

said first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color;

said second optical thickness is greater than an optical thickness of a second order interference color; and

the pigment exhibits a color-shifting effect.

25. The pigment of claim 24, wherein said metal oxide having a low refractive index is SiO_2.

26. The pigment of claim 24, wherein said metal oxide having a high refractive index is selected from TiO_2, SnO_2, Fe_2O_3, Fe_3O_4, CoO, Co_2O_3, ZrO_2, Cr_2O_3, and mixtures and derivatives thereof.

27. The pigment of claim 24, wherein said outer protective layer is an organic or an inorganic ferrous pigment.

28. A pigment exhibiting a color-shifting effect comprising

a base material;

a first layer having a first optical thickness that is well-defined;

a second layer having a second optical thickness that is well-defined;

a third layer; and

optionally an outer protective layer,

wherein

said base material is a mica;

said first layer and said third layer each independently comprise a metal oxide having a high refractive index;

said second layer comprises a metal oxide having a low refractive index;

said base material is coated with (1) said first layer, (2) said second layer, (3) said third layer, and optionally (4) said outer protective layer, said first layer being in direct contact with said base material, said second layer being in direct contact with said first layer and said third layer, and said protective layer being in direct contact with said third layer;

said first optical thickness is greater than an optical thickness of silver-white interference color and smaller than an optical thickness of golden-yellow interference color;

said second optical thickness is greater than an optical thickness of a second order green interference color and smaller than an optical thickness of a fourth order interference color; and

the pigment exhibits a color-shifting effect.

29. The pigment of claim 28, wherein said metal oxide having a low refractive index is SiO_2.

30. The pigment of claim 28, wherein said metal oxide having a high refractive index is selected from TiO_2, SnO_2, Fe_2O_3, Fe_3O_4, CoO, Co_2O_3, ZrO_2, Cr_2O_3, and mixtures and derivatives thereof.

31. The pigment of claim 28, wherein said outer protective layer is an organic or an inorganic ferrous pigment.

IX. EVIDENCE APPENDIX

None

X. RELATED PROCEEDINGS APPENDIX

None